J11-1172962

Machine translation

CLAIMS

[Claim(s)]
[Claim 1] The maintenance approach of the distilling column characterized by having installed the distilling column in the interior of a cylinder base material, and holding a distilling column with a cylinder base material in the maintenance approach of a distilling column.
[Claim 2] The maintenance approach of the distilling column according to claim 1 characterized by holding other distilling columns and an ancillary device in the periphery section of a cylinder base material.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the maintenance approach of a distilling column used for distillation separation of the matter.
[0002]
[Description of the Prior Art] For example, in order to collect Indore of the minute amount contained just over or below 0.2% in a coal tar by the high grade A coal tar is distilled. Tar light oil, carbolic oil, naphthalene oil, treated oil, Separate into load tar, distill the deoxidation naphthalene oil which carried out the alkali extract of the tar acid in naphthalene oil, and 95% naphthalene is collected. DeQ-NRO which carried out the sulfuric-acid extract of the tar base in a naphthalene residue oil After inserting in a distilling column 41 and removing the light parts 42, such as naphthalene, as shown in drawing 4 , Add an entrainer, insert in the azeotropy distilling column 43, carry out azeotropic distillation, and monomethyl naphthalene is made to distill from an upper case with an entrainer. It puts by the separation tub 44 and separation recovery of the entrainer is carried out, after making the entrainer which distills monomethyl naphthalene in a distilling column 45, and is mixed distill, superfractionation is carried out in the precision distilling column 46, and separation recovery of beta-methyl naphthalene and the alpha methyl naphthalene is carried out. On the other hand, the bottom oil of 10% of Indore concentration extracted from the bottom of the azeotropy distilling column 43 The monomethyl naphthalene which adds an entrainer, carries out azeotropic distillation again in the azeotropy distilling column 48, and remains once storing in a tank 47 After separating heavy components, such as a dimethyl naphthalene isomer and an acenaphthene, with an entrainer, the dimethyl naphthalene which carries out superfractionation of Indore of about 80% of concentration in the precision distilling column 49, and remains, and other heavy components are separated, and Indore of 94% or more of concentration is collected. In addition, the separation tub to which 50 carries out separation recovery of the entrainer, and 51 are the distilling columns for making the entrainer mixed in heavy components, such as monomethyl naphthalene, and a dimethyl naphthalene isomer, an acenaphthene, distill.
[0003] As the distilling column 43 which carries out azeotropic distillation of the demineralization radical naphthalene residue oil which contains beta-methyl naphthalene of 241.1 degrees C of boiling points, and the alpha methyl naphthalene of 244.8 degrees C of boiling points among the above, and a distilling column 46 which carries out superfractionation of the monomethyl naphthalene and separates an alpha methyl naphthalene and beta-methyl naphthalene, the precision distilling column before and behind 100 steps of theoretical plate numbers is used.
[0004] Moreover, as a precision distilling column 49 where the distilling column before and behind 80 steps of theoretical plate numbers carries out superfractionation of Indore of about 80% of concentration, and collects Indore of a high grade as an azeotropy distilling column 48 which separates the dimethyl naphthalene isomer of 262 degrees C - 270 degrees C of boiling points which are an impurity about Indore of 254 degrees C of boiling points, and the acenaphthene of 277 degrees C of boiling points by azeotropic distillation, the distilling column before and behind 50 steps of theoretical plate numbers is used.
[0005] the column of the high theoretical plate number when superfractionation recovers the product of a high grade as mentioned above, i.e., a column, -- it is indispensable to use the high distilling column of quantity. Conventionally, after building the engine frame 63 which consisted of a stanchion 61, a beam, and a floor 62 beforehand there as construction of a distilling column is shown in drawing 5 ,

installation ****** is adopted in distilling columns 64, 65, and 66 in the engine frame 63.
[0006]
[Problem(s) to be Solved by the Invention] Since a field erection work is a subject by said conventional method of construction, the time necessary for completion is long, and since it consists of a stanchion, a beam, and a floor and the perimeter serves as blow by, even if the engine frame has covered the external surface of a distilling column with the heat insulator, its heat dissipation from a distilling-column outside surface is large. For this reason, stable operation is not only difficult, but as for the small distilling column of a tower diameter, temperature changes, and it has the fault that the heat dissipation loss of energy is large.
[0007] The purpose of this invention cancels the fault of the above-mentioned conventional technique, and it is to offer the maintenance approach of the distilling column which can control the heat dissipation from a distilling-column outside surface while it can shorten the time necessary for completion by considering as the prefab method of construction which makes shop fabrication a subject.
[0008]
[Means for Solving the Problem] The maintenance approach of the distilling column of claim 1 of this invention installs a distilling column in the interior of a cylinder base material, and is presupposing it that a distilling column is held with a cylinder base material. Thus, while being able to consider as the prefab method of construction which makes shop fabrication a subject by arranging a distilling column inside a cylinder base material, and holding a distilling column with a cylinder base material and being able to shorten the time necessary for completion sharply, since the perimeter of a distilling column is covered with a cylinder base material, the heat dissipation from a distilling-column outside surface is controlled, stable operation of the distilling column can be carried out, and an energy loss can be reduced.
[0009] Moreover, suppose the manner of support of the distilling column of claim 2 of this invention that other distilling columns and an ancillary device are held in the periphery section of a cylinder base material in claim 1. Thus, while being able to consider as the prefab method of construction which makes shop fabrication a subject by holding other distilling columns and an ancillary device in the periphery section of a cylinder base material and being able to shorten the time necessary for completion sharply, it is not necessary to prepare an engine frame and the part steel materials can be reduced.
[0010]
[Embodiment of the Invention] The tower diameter holding a distilling column of a cylinder base material is determined from the tooth space which works inside a cylinder base material. For example, if it is the outer diameter of 500mm of a distilling column, and the heat insulator thickness of 115mm which keeps a distilling column warm, since the tower diameter of a distilling column will be 500mm+115mmx2=730mm and the still will be installed in the lower part of a distilling column, when the tooth space is taken into count, the occupancy area of a distilling column is equivalent to about 1000mm tower diameter. On the other hand, in order to work around a distilling column, it is required to take a tooth space with a width of face of 600mm or more, and the tower diameter of a cylinder base material should carry out to more than 1000mm+600mmx2=2200mm.
[0011] On the other hand, when a cylinder base material enlarges a tower diameter, a wind load etc. becomes large and reinforcement will be required more. the reinforcement of a cylinder base material -- thick -- adjusting -- for example, a column -- in 2400mm of tower diameters holding the distilling column of 34m of quantities of a cylinder base material, in order to maintain sufficient reinforcement, it is necessary to set board thickness for 12mm and the upper part to 6mm for the board thickness for the lower part
[0012] Since maintenance of the distilling column of this invention is installed in the interior of a cylinder base material and is held with a cylinder base material, shop fabrication of it can be beforehand divided and carried out to two or more blocks, and it can adopt the prefab method of construction assembled there. While arranging the distilling column divided in this prefab method of construction at plurality in the cylinder base material divided into plurality at works Piping is arranged in a cylinder base material. The cylinder base material during each block, a distilling column, After fixing with a foundation bolt, piping is laid for the cylinder base material of a flange connection, nothing, and a bottom block one by one, after lower-berth blocking each block, and the flange of a cylinder base material, a distilling column, and piping is bound tight and assembled with a bolt.
[0013] moreover, the case where two or more distilling columns are held with a cylinder base material -- a column -- the distilling column of quantity high, No. 1 is made to arrange and hold in a cylinder base material, and other distilling columns, an ancillary device, for example, a reboiler, a capacitor, a tank, a platform, a stairway, etc. are made to arrange and hold in the periphery section of a cylinder

base material furthermore, a column -- when installing two or more distilling columns where quantity is high, all distilling columns can also be made to arrange and hold in a cylinder base material
[0014]
[Example] It explains to one or less example based on drawing 1 which shows an example of operation of the detail of this invention. Drawing 1 is an approximate account Fig. in the case of the maintenance approach of the distilling column of this invention being shown, and dividing into three steps, carrying out shop fabrication, and assembling there.
[0015] the column which 1 was a cylinder base material, and was divided into three steps of 1a-1c, and was divided into three steps of 2a-2c in drawing 1 in the core -- the distilling column 2 of quantity high No. 1 is supported. Moreover, the distilling column 4 divided into three steps of 4a-4c through the supporter material 3 and the distilling column 5 divided into three steps of 5a-5c are supported by the periphery of each cylinder base materials 1a-1c, and each block object A-C is constituted on it.
[0016] Each block object A-C is manufactured at works, and is assembled one by one from the block object A on a local foundation. Connection of each block object A-C fixes the cylinder base material 1a lower part of the block object A with a foundation bolt on a local foundation. And although each cylinder base materials 1a-1c of each block object A-C, each distilling columns 2a-2c, 4a-4c, and 5a-5c are not illustrating, the flange of a connection is connected with a bolt and setting them up is finished, and predetermined spacing, for example, the tooth space 600mm or more which can be worked, is prepared between the distilling column 2 and the cylinder base material 1.
[0017] Moreover, the canopy 6 for preventing permeation of storm sewage is formed in the upper part of topmost cylinder base material 1c. For this reason, since envelopment sealing of the perimeter is carried out with the cylinder base material 1, the distilling column 2 has the stable temperature in the cylinder base material 1, and the heat dissipation from the outside surface of a distilling column 2 is controlled, and it is constituted [it can carry out stable operation, and] so that energy saving can be aimed at.
[0018] Moreover, although piping is not illustrating, it is arranged in cylinder base material 1a - 1c, and bolt connection is made through a flange like connection of each cylinder base materials 1a-1c of each block object A-C, each distilling columns 2a-2c, 4a-4c, and 5a-5c. furthermore -- even if a flow rate directions regulator valve and a pressure gage are installed in the exterior of the cylinder base material 1 and it does not enter in the cylinder base material 1 -- flow control and a column -- internal pressure can be checked now.
[0019] the lower-berth reboiler section of the distilling column 2 inside cylinder base material 1a - 1c, and the middle -- the operating platform for the assembly of each block object A-C and decomposition is prepared in the feed section and the upper case heat-exchanger section. As for the cylinder base material 1, the operating platform for the assembly of each block object A-C and decomposition is prepared in the upper part of each cylinder base materials 1a-1c.
[0020] In order to build each block object A-C manufactured by having constituted as above-mentioned at works on the foundation of a spot After laying the block object A on a foundation first, binding tight with a foundation bolt and fixing cylinder base material 1a, The block object B is laid on the block object A, and while fixing each flange of distilling-column 2a, 2b, distilling columns 4a and 4b, distilling columns 5a and 5b, and the cylinder base materials 1a and 1b with a bolt and connecting, the flange of each piping is connected with a bolt. Subsequently, the block object C is laid on the block object B, while fixing each flange of distilling-column 2b, 2c, distilling columns 4b and 4c, distilling columns 5b and 5c, and the cylinder base materials 1b and 1c with a bolt and connecting, the flange of each piping is connected with a bolt and a construction activity is completed.
[0021] therefore, a column -- it can aim at energy saving while the heat dissipation from an outside surface is controlled, and temperature is stabilized by it and it can carry out stable operation of the distilling column 2, since envelopment sealing of the perimeter is carried out with the cylinder base material 1, and the distilling column 2 of quantity high No. 1 has the stable temperature in the cylinder base material 1. Moreover, it does not need to install an engine frame and can reduce the amount of the steel materials used, and a construction cost while it can shorten the time necessary for completion to one half of the conventional methods of construction, since each block object A-C is manufactured at works. Furthermore, since piping installed most in the cylinder base material 1, it can control the corrosion of piping.
[0022] as being shown in example 2 drawing 2 and drawing 3 -- a column -- quantity:34192mm and a column -- bore: -- 500mm Restoration height : the periphery of the distilling column filled up with 28380mm, packing:Sumitomo Heavy Industries, Ltd. make, and trade name Sulzer MERAPAKKU 350Y The distilling column 21 covered with the heat insulator (pearlite) with a thickness of 115mm was made to arrange and hold in height:40700mm, the bore of 2400mm, and the thickness:cylinder base material 22 of 12mm of lower parts, and 6mm of upper parts. moreover, a column --

quantity:15724mm and a column -- the exterior of the cylinder base material 22 was made to support the distilling column 23 which kept warm the periphery of the distilling column filled up with bore:400mm, restoration height:10965mm, packing:Sumitomo Heavy Industries, Ltd. make, and trade name Sulzer MERAPAKKU 350Y with the heat insulator (pearlite) with a thickness of 115mm by the supporter material 24, and it was installed in it. furthermore, a column -- quantity:6503mm and a column -- the exterior of the cylinder base material 22 was made to support the distilling column 25 which kept warm the periphery of the distilling column filled up with bore:500mm, restoration height:4085mm, packing:Sumitomo Heavy Industries, Ltd. make, and trade name Sulzer MERAPAKKU 350Y with the heat insulator (pearlite) with a thickness of 115mm by the supporter material 24, and it was installed in it. Furthermore, while connecting heat exchangers 26, 27, and 28 with each crowning of each distilling columns 21, 23, and 25, reboilers 29, 30 (not shown), and 31 have been arranged in each lower part, respectively. In addition, as for a thermal heating furnace and 33, 32 is [a chimney stack and 34] the canopies of the cylinder base material 22.
[0023] After supplying the still residue oil of the naphthalene distillation of 4.5% of Indore concentration which carried out demineralization radical processing to the distilling column 23 of drawing 2 and drawing 3 and removing light parts, such as naphthalene, added the diethylene glycol as an entrainer and inserted in the middle of a distilling column 21, and carried out azeotropic distillation, the monomethyl naphthalene fraction and the diethylene glycol were made to distill, and the bottom oil of 10% of Indore concentration was extracted from the bottom. The monomethyl naphthalene fraction and diethylene glycol which were made to distill were put, separated the diethylene glycol, after they removed the diethylene glycol mixed in a distilling column 25, were supplied to the precision distilling column which is not illustrated, and carried out separation recovery of alpha-monomethyl naphthalene and the beta-monomethyl naphthalene. the azeotropic distillation which does not illustrate the bottom oil of 10% of Indore concentration extracted from the bottom of a distilling column 21 -- it distilled in the column and the precision distilling column, and Indore of 94% or more of concentration was collected.
[0024] About each of the distilling column 21 installed in the cylinder base material 22 in the above-mentioned distillation, and the distilling column 25 installed in the exterior of the cylinder base material 22, the heat exchanger engine-performance verification test was carried out for three days, and the average was calculated. The result is shown in Table 1.
[0025]
[Table 1]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is an approximate account Fig. in the case of the maintenance approach of the distilling column of this invention being shown, and dividing into three steps, carrying out shop fabrication, and assembling there.
[Drawing 2] It is the front view of the distillation facility used in the example 2.
[Drawing 3] It is the side elevation of the distillation facility used in the example 2.
[Drawing 4] It is the schematic diagram of the manufacturing facility of Indore.
[Drawing 5] The perspective view in the condition that the (a) Fig. built the engine frame in the explanatory view of a field-erection-work subject's conventional method of construction, and the (b) Fig. are perspective views in the condition of having installed the distilling column within the enclosure of a rack.
[Description of Notations]
1 22 Cylinder base material
2, 4, 5, 21, 23, 25, 41, 45, 51, 64, 65, 66 Distilling column
3 24 Supporter material
6 34 Canopy
26, 27, 28 Heat exchanger
29, 30, 31 Reboiler
32 Heating Furnace
33 Chimney Stack
42 Light Part
43 48 Azeotropy distilling column
44 50 Separation tub
46 49 Precision distilling column
47 Tank

61 Stanchion
62 Floor
63 Engine Frame
A-C Block object

[0026] The heat dissipation loss of the distilling column 21 installed in the cylinder base material 22 can be being reduced to 3 by about 2/with 32.9% as compared with heat dissipation loss 48.7% of the distilling column 25 installed out of the cylinder base material 22 as shown in Table 1.
[0027]
[Effect of the Invention] Since the perimeter of a distilling column is covered with a cylinder base material, the heat dissipation from a distilling-column outside surface is controlled, and the maintenance approach of the distilling column of claim 1 of this invention can carry out stable operation of the distilling column, and can reduce an energy loss while it can be made into the prefab method of construction which makes shop fabrication a subject by having installed the distilling column in the interior of a cylinder base material, and having held the distilling column with the cylinder base material and can shorten the time necessary for completion sharply.
[0028] Moreover, the maintenance approach of the distilling column of claim 2 of this invention does not need to prepare an engine frame, and can reduce the part steel materials while it can be made into the prefab method of construction which makes shop fabrication a subject by holding other distilling columns and an ancillary device in the periphery section of a cylinder base material in claim 1 and can shorten the time necessary for completion sharply.

TECHNICAL FIELD

[Field of the Invention] This invention relates to the maintenance approach of a distilling column used for distillation separation of the matter.

PRIOR ART

[Description of the Prior Art] For example, in order to collect Indore of the minute amount contained just over or below 0.2% in a coal tar by the high grade A coal tar is distilled. Tar light oil, carbolic oil, naphthalene oil, treated oil, Separate into load tar, distill the deoxidation naphthalene oil which carried out the alkali extract of the tar acid in naphthalene oil, and 95% naphthalene is collected. DeQ-NRO which carried out the sulfuric-acid extract of the tar base in a naphthalene residue oil After inserting in a distilling column 41 and removing the light parts 42, such as naphthalene, as shown in drawing 4 . Add an entrainer, insert in the azeotropy distilling column 43, carry out azeotropic distillation, and monomethyl naphthalene is made to distill from an upper case with an entrainer. It puts by the

separation tub 44 and separation recovery of the entrainer is carried out, after making the entrainer which distills monomethyl naphthalene in a distilling column 45, and is mixed distill, superfractionation is carried out in the precision distilling column 46, and separation recovery of beta-methyl naphthalene and the alpha methyl naphthalene is carried out. On the other hand, the bottom oil of 10% of Indore concentration extracted from the bottom of the azeotropy distilling column 43 The monomethyl naphthalene which adds an entrainer, carries out azeotropic distillation again in the azeotropy distilling column 48, and remains once storing in a tank 47 After separating heavy components, such as a dimethyl naphthalene isomer and an acenaphthene, with an entrainer, the dimethyl naphthalene which carries out superfractionation of Indore of about 80% of concentration in the precision distilling column 49, and remains, and other heavy components are separated, and Indore of 94% or more of concentration is collected. In addition, the separation tub to which 50 carries out separation recovery of the entrainer, and 51 are the distilling columns for making the entrainer mixed in heavy components, such as monomethyl naphthalene, and a dimethyl naphthalene isomer, an acenaphthene, distill.
[0003] As the distilling column 43 which carries out azeotropic distillation of the demineralization radical naphthalene residue oil which contains beta-methyl naphthalene of 241.1 degrees C of boiling points; and the alpha methyl naphthalene of 244.8 degrees C of boiling points among the above, and a distilling column 46 which carries out superfractionation of the monomethyl naphthalene and separates an alpha methyl naphthalene and beta-methyl naphthalene, the precision distilling column before and behind 100 steps of theoretical plate numbers is used.
[0004] Moreover, as a precision distilling column 49 where the distilling column before and behind 80 steps of theoretical plate numbers carries out superfractionation of Indore of about 80% of concentration, and collects Indore of a high grade as an azeotropy distilling column 48 which separates the dimethyl naphthalene isomer of 262 degrees C - 270 degrees C of boiling points which are an impurity about Indore of 254 degrees C of boiling points, and the acenaphthene of 277 degrees C of boiling points by azeotropic distillation, the distilling column before and behind 50 steps of theoretical plate numbers is used.
[0005] the column of the high theoretical plate number when superfractionation recovers the product of a high grade as mentioned above, i.e., a column, -- it is indispensable to use the high distilling column of quantity. Conventionally, after building the engine frame 63 which consisted of a stanchion 61, a beam, and a floor 62 beforehand there as construction of a distilling column is shown in drawing 5 , installation ****** is adopted in distilling columns 64, 65, and 66 in the engine frame 63.

EFFECT OF THE INVENTION

[Effect of the Invention] Since the perimeter of a distilling column is covered with a cylinder base material, the heat dissipation from a distilling-column outside surface is controlled, and the maintenance approach of the distilling column of claim 1 of this invention can carry out stable operation of the distilling column, and can reduce an energy loss while it can be made into the prefab method of construction which makes shop fabrication a subject by having installed the distilling column in the interior of a cylinder base material, and having held the distilling column with the cylinder base material and can shorten the time necessary for completion sharply.
[0028] Moreover, the maintenance approach of the distilling column of claim 2 of this invention does not need to prepare an engine frame, and can reduce the part steel materials while it can be made into the prefab method of construction which makes shop fabrication a subject by holding other distilling columns and an ancillary device in the periphery section of a cylinder base material in claim 1 and can shorten the time necessary for completion sharply.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Since a field erection work is a subject by said conventional method of construction, the time necessary for completion is long, and since it consists of a stanchion, a beam, and a floor and the perimeter serves as blow by, even if the engine frame has covered the external surface of a distilling column with the heat insulator, its heat dissipation from a distilling-column outside surface is large. For this reason, stable operation is not only difficult, but as for the small distilling column of a tower diameter, temperature changes, and it has the fault that the heat dissipation loss of energy is large.
[0007] The purpose of this invention cancels the fault of the above-mentioned conventional technique, and it is to offer the maintenance approach of the distilling column which can control the heat dissipation from a distilling-column outside surface while it can shorten the time necessary for

completion by considering as the prefab method of construction which makes shop fabrication a subject.

MEANS

[Means for Solving the Problem] The maintenance approach of the distilling column of claim 1 of this invention installs a distilling column in the interior of a cylinder base material, and is presupposing it that a distilling column is held with a cylinder base material. Thus, while being able to consider as the prefab method of construction which makes shop fabrication a subject by arranging a distilling column inside a cylinder base material, and holding a distilling column with a cylinder base material and being able to shorten the time necessary for completion sharply, since the perimeter of a distilling column is covered with a cylinder base material, the heat dissipation from a distilling-column outside surface is controlled, stable operation of the distilling column can be carried out, and an energy loss can be reduced.

[0009] Moreover, suppose the manner of support of the distilling column of claim 2 of this invention that other distilling columns and an ancillary device are held in the periphery section of a cylinder base material in claim 1. Thus, while being able to consider as the prefab method of construction which makes shop fabrication a subject by holding other distilling columns and an ancillary device in the periphery section of a cylinder base material and being able to shorten the time necessary for completion sharply, it is not necessary to prepare an engine frame and the part steel materials can be reduced.

[0010]

[Embodiment of the Invention] The tower diameter holding a distilling column of a cylinder base material is determined from the tooth space which works inside a cylinder base material. For example, if it is the outer diameter of 500mm of a distilling column, and the heat insulator thickness of 115mm which keeps a distilling column warm, since the tower diameter of a distilling column will be 500mm+115mmx2=730mm and the still will be installed in the lower part of a distilling column, when the tooth space is taken into count, the occupancy area of a distilling column is equivalent to about 1000mm tower diameter. On the other hand, in order to work around a distilling column, it is required to take a tooth space with a width of face of 600mm or more, and the tower diameter of a cylinder base material should carry out to more than 1000mm+600mmx2=2200mm.

[0011] On the other hand, when a cylinder base material enlarges a tower diameter, a wind load etc. becomes large and reinforcement will be required more. the reinforcement of a cylinder base material -- thick -- adjusting -- for example, a column -- in 2400mm of tower diameters holding the distilling column of 34m of quantities of a cylinder base material, in order to maintain sufficient reinforcement, it is necessary to set board thickness for 12mm and the upper part to 6mm for the board thickness for the lower part

[0012] Since maintenance of the distilling column of this invention is installed in the interior of a cylinder base material and is held with a cylinder base material, shop fabrication of it can be beforehand divided and carried out to two or more blocks, and it can adopt the prefab method of construction assembled there. While arranging the distilling column divided in this prefab method of construction at plurality in the cylinder base material divided into plurality at works Piping is arranged in a cylinder base material. The cylinder base material during each block, a distilling column, After fixing with a foundation bolt, piping is laid for the cylinder base material of a flange connection, nothing, and a bottom block one by one, after lower-berth blocking each block, and the flange of a cylinder base material, a distilling column, and piping is bound tight and assembled with a bolt.

[0013] moreover, the case where two or more distilling columns are held with a cylinder base material -- a column -- the distilling column of quantity high, No. 1 is made to arrange and hold in a cylinder base material, and other distilling columns, an ancillary device, for example, a reboiler, a capacitor, a tank, a platform, a stairway, etc. are made to arrange and hold in the periphery section of a cylinder base material furthermore, a column -- when installing two or more distilling columns where quantity is high, all distilling columns can also be made to arrange and hold in a cylinder base material

EXAMPLE

[Example] It explains to one or less example based on drawing 1 which shows an example of operation of the detail of this invention. Drawing 1 is an approximate account Fig. in the case of the

maintenance approach of the distilling column of this invention being shown, and dividing into three steps, carrying out shop fabrication, and assembling there.
[0015] the column which 1 was a cylinder base material, and was divided into three steps of 1a-1c, and was divided into three steps of 2a-2c in drawing 1 in the core -- the distilling column 2 of quantity high No. 1 is supported. Moreover, the distilling column 4 divided into three steps of 4a-4c through the supporter material 3 and the distilling column 5 divided into three steps of 5a-5c are supported by the periphery of each cylinder base materials 1a-1c, and each block object A-C is constituted on it.
[0016] Each block object A-C is manufactured at works, and is assembled one by one from the block object A on a local foundation. Connection of each block object A-C fixes the cylinder base material 1a lower part of the block object A with a foundation bolt on a local foundation. And although each cylinder base materials 1a-1c of each block object A-C, each distilling columns 2a-2c, 4a-4c, and 5a-5c are not illustrating, the flange of a connection is connected with a bolt and setting them up is finished, and predetermined spacing, for example, the tooth space 600mm or more which can be worked, is prepared between the distilling column 2 and the cylinder base material 1.
[0017] Moreover, the canopy 6 for preventing permeation of storm sewage is formed in the upper part of topmost cylinder base material 1c. For this reason, since envelopment sealing of the perimeter is carried out with the cylinder base material 1, the distilling column 2 has the stable temperature in the cylinder base material 1, and the heat dissipation from the outside surface of a distilling column 2 is controlled, and it is constituted [it can carry out stable operation, and] so that energy saving can be aimed at.
[0018] Moreover, although piping is not illustrating, it is arranged in cylinder base material 1a - 1c, and bolt connection is made through a flange like connection of each cylinder base materials 1a-1c of each block object A-C, each distilling columns 2a-2c, 4a-4c, and 5a-5c. furthermore -- even if a flow rate directions regulator valve and a pressure gage are installed in the exterior of the cylinder base material 1 and it does not enter in the cylinder base material 1 -- flow control and a column -- internal pressure can be checked now.
[0019] the lower-berth reboiler section of the distilling column 2 inside cylinder base material 1a - 1c, and the middle -- the operating platform for the assembly of each block object A-C and decomposition is prepared in the feed section and the upper case heat-exchanger section. As for the cylinder base material 1, the operating platform for the assembly of each block object A-C and decomposition is prepared in the upper part of each cylinder base materials 1a-1c.
[0020] In order to build each block object A-C manufactured by having constituted as above-mentioned at works on the foundation of a spot After laying the block object A on a foundation first, binding tight with a foundation bolt and fixing cylinder base material 1a, The block object B is laid on the block object A, and while fixing each flange of distilling-column 2a, 2b, distilling columns 4a and 4b, distilling columns 5a and 5b, and the cylinder base materials 1a and 1b with a bolt and connecting, the flange of each piping is connected with a bolt. Subsequently, the block object C is laid on the block object B, while fixing each flange of distilling-column 2b, 2c, distilling columns 4b and 4c, distilling columns 5b and 5c, and the cylinder base materials 1b and 1c with a bolt and connecting, the flange of each piping is connected with a bolt and a construction activity is completed.
[0021] therefore, a column -- it can aim at energy saving while the heat dissipation from an outside surface is controlled, and temperature is stabilized by it and it can carry out stable operation of the distilling column 2, since envelopment sealing of the perimeter is carried out with the cylinder base material 1, and the distilling column 2 of quantity high No. 1 has the stable temperature in the cylinder base material 1. Moreover, it does not need to install an engine frame and can reduce the amount of the steel materials used, and a construction cost while it can shorten the time necessary for completion to one half of the conventional methods of construction, since each block object A-C is manufactured at works. Furthermore, since piping installed most in the cylinder base material 1, it can control the corrosion of piping.
[0022] as being shown in example 2 drawing 2 and drawing 3 -- a column -- quantity:34192mm and a column -- bore: -- 500mm Restoration height : the periphery of the distilling column filled up with 28380mm, packing:Sumitomo Heavy Industries, Ltd. make, and trade name Sulzer MERAPAKKU 350Y The distilling column 21 covered with the heat insulator (pearlite) with a thickness of 115mm was made to arrange and hold in height:40700mm, the bore of 2400mm, and the thickness:cylinder base material 22 of 12mm of lower parts, and 6mm of upper parts. moreover, a column -- quantity:15724mm and a column -- the exterior of the cylinder base material 22 was made to support the distilling column 23 which kept warm the periphery of the distilling column filled up with bore:400mm, restoration height:10965mm, packing:Sumitomo Heavy Industries, Ltd. make, and trade name Sulzer MERAPAKKU 350Y with the heat insulator (pearlite) with a thickness of 115mm by the supporter material 24, and it was installed in it. furthermore, a column -- quantity:6503mm and a

column -- the exterior of the cylinder base material 22 was made to support the distilling column 25 which kept warm the periphery of the distilling column filled up with bore:500mm, restoration height:4085mm, packing:Sumitomo Heavy Industries, Ltd. make, and trade name Sulzer MERAPAKKU 350Y with the heat insulator (pearlite) with a thickness of 115mm by the supporter material 24, and it was installed in it. Furthermore, while connecting heat exchangers 26, 27, and 28 with each crowning of each distilling columns 21, 23, and 25, reboilers 29, 30 (not shown), and 31 have been arranged in each lower part, respectively. In addition, as for a thermal heating furnace and 33, 32 is [a chimney stack and 34] the canopies of the cylinder base material 22.

[0023] After supplying the still residue oil of the naphthalene distillation of 4.5% of Indore concentration which carried out demineralization radical processing to the distilling column 23 of drawing 2 and drawing 3 and removing light parts, such as naphthalene, added the diethylene glycol as an entrainer and inserted in the middle of a distilling column 21, and carried out azeotropic distillation, the monomethyl naphthalene fraction and the diethylene glycol were made to distill, and the bottom oil of 10% of Indore concentration was extracted from the bottom. The monomethyl naphthalene fraction and diethylene glycol which were made to distill were put, separated the diethylene glycol, after they removed the diethylene glycol mixed in a distilling column 25, were supplied to the precision distilling column which is not illustrated, and carried out separation recovery of alpha-monomethyl naphthalene and the beta-monomethyl naphthalene. the azeotropic distillation which does not illustrate the bottom oil of 10% of Indore concentration extracted from the bottom of a distilling column 21 -- it distilled in the column and the precision distilling column, and Indore of 94% or more of concentration was collected.

[0024] About each of the distilling column 21 installed in the cylinder base material 22 in the above-mentioned distillation, and the distilling column 25 installed in the exterior of the cylinder base material 22, the heat exchanger engine-performance verification test was carried out for three days, and the average was calculated. The result is shown in Table 1.

[0025]

[Table 1]

[0026] The heat dissipation loss of the distilling column 21 installed in the cylinder base material 22 can be being reduced to 3 by about 2/with 32.9% as compared with heat dissipation loss 48.7% of the distilling column 25 installed out of the cylinder base material 22 as shown in Table 1.

D3

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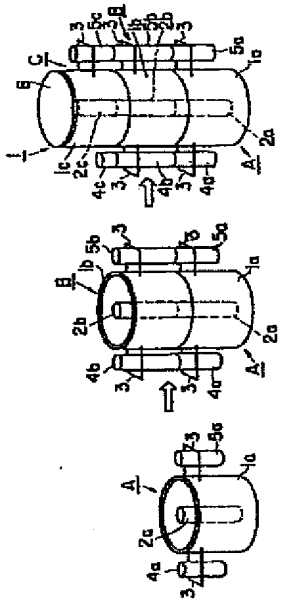
最終頁に続く

(54)【発明の名称】　蒸留塔の保持方法

(57)【要約】
【課題】　工期を短縮できると共に、蒸留塔外表面からの放熱を抑制できる蒸留塔の保持方法を提供すること。
【解決手段】　蒸留塔２の保持方法であって、円筒支持体１の内部に蒸留塔２を設置し、円筒支持体１で蒸留塔２を保持することによって、工場製作を主体とするプレハブ工法とすることができ、工期を大幅に短縮できると共に、蒸留塔２外表面からの放熱が抑制され、蒸留塔２を安定運転でき、エネルギーロスを低減できる。



【特許請求の範囲】
【請求項１】　蒸留塔の保持方法において、円筒支持体の内部に蒸留塔を設置し、円筒支持体で蒸留塔を保持したことを特徴とする蒸留塔の保持方法。
【請求項２】　円筒支持体の外周部で他の蒸留塔、付属機器を保持したことを特徴とする請求項１記載の蒸留塔の保持方法。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、物質の蒸留分離に用いる蒸留塔の保持方法に関する。
【０００２】
【従来の技術】例えば、コールタール中に０．２％前後含有する微量のインドールを高純度で回収するには、コールタールを蒸留してタール軽油、カルボル油、ナフタリン油、洗浄油、ロードタールに分離し、ナフタリン油中のタール酸類をアルカリ抽出した脱酸ナフタリン油を蒸留して９５％ナフタリンを回収し、ナフタリン残渣油中のタール塩基類を硫酸抽出した脱Ｑ－ＮＲＯを、図４に示すとおり、蒸留塔４１に装入してナフタリン等の軽質分４２を除去したのち、共沸剤を添加して共沸蒸留塔４３に装入して共沸蒸留し、モノメチルナフタリン類を共沸剤と共に上段より留出させ、分離槽４４で静置して共沸剤を分離回収し、モノメチルナフタリン類を蒸留塔４５で蒸留して混入している共沸剤を留出させたのち、精密蒸留塔４６で精密蒸留し、β－メチルナフタリンとα－メチルナフタリンを分離回収する。一方、共沸蒸留塔４３の塔底から抜き出したインドール濃度１０％の塔底油は、一旦タンク４７に蓄えたのち、共沸剤を添加して共沸蒸留塔４８で再度共沸蒸留し、残留するモノメチルナフタリン類と、ジメチルナフタリン異性体、アセナフテン等の重質成分を共沸剤と共に分離したのち、濃度約８０％のインドールを精密蒸留塔４９で精密蒸留して残留するジメチルナフタリン類、その他重質成分を分離し、濃度９４％以上のインドールを回収している。なお、５０は共沸剤を分離回収する分離槽、５１はモノメチルナフタリン類と、ジメチルナフタリン異性体、アセナフテン等の重質成分に混入した共沸剤を留出させるための蒸留塔である。
【０００３】上記のうち、沸点２４１．１℃のβ－メチルナフタリンと沸点２４４．８℃のα－メチルナフタリンを含む脱塩基ナフタリン残渣油を共沸蒸留する蒸留塔４３、モノメチルナフタリン類を精密蒸留してα－メチルナフタリンとβ－メチルナフタリンを分離する蒸留塔４６としては、理論段数１００段前後の精密蒸留塔が使用されている。
【０００４】また、沸点２５４℃のインドールを不純物である沸点２６２℃～２７０℃のジメチルナフタリン異性体、沸点２７７℃のアセナフテンを共沸蒸留により分離する共沸蒸留塔４８としては、理論段数８０段前後の蒸留塔が、濃度約８０％のインドールを精密蒸留して高純度のインドールを回収する精密蒸留塔４９としては、理論段数５０段前後の蒸留塔が使用されている。
【０００５】上記のように高純度の製品を精密蒸留により回収する場合には、高理論段数の塔、すなわち、塔高の高い蒸留塔を使用することが不可欠である。従来、蒸留塔の建設は、図５に示すとおり、現地に予め支柱６１、梁および床６２から構成された架構６３を構築したのち、架構６３内に蒸留塔６４、６５、６６を据付る工法が採用されている。
【０００６】
【発明が解決しようとする課題】前記従来工法では、現地工事が主体のため、工期が長く、かつ、架構は支柱、梁および床から構成され、周囲が吹き抜けとなっているため、蒸留塔の外面を断熱材で覆っていても、蒸留塔外表面からの放熱が大きい。このため、塔径の小さい蒸留塔は、温度が変化して安定運転が困難であるばかりでなく、エネルギーの放熱ロスが大きいという欠点を有している。
【０００７】本発明の目的は、上記従来技術の欠点を解消し、工場製作を主体とするプレハブ工法とすることにより工期を短縮できると共に、蒸留塔外表面からの放熱を抑制できる蒸留塔の保持方法を提供することにある。
【０００８】
【課題を解決するための手段】本発明の請求項１の蒸留塔の保持方法は、円筒支持体の内部に蒸留塔を設置し、円筒支持体で蒸留塔を保持することとしている。このように、円筒支持体の内部に蒸留塔を配置し、円筒支持体で蒸留塔を保持することによって、工場製作を主体とするプレハブ工法とすることができ、工期を大幅に短縮できると共に、蒸留塔の周囲が円筒支持体で覆われるため蒸留塔外表面からの放熱が抑制され、蒸留塔を安定運転でき、エネルギーロスを低減することができる。
【０００９】また、本発明の請求項２の蒸留塔の支持方法は、請求項１において円筒支持体の外周部で他の蒸留塔、付属機器を保持することとしている。このように、円筒支持体の外周部で他の蒸留塔、付属機器を保持することによって、工場製作を主体とするプレハブ工法とすることができ、工期を大幅に短縮できると共に、架構を設ける必要がなく、その分鋼材を節減することができる。
【００１０】
【発明の実施の形態】蒸留塔を保持する円筒支持体の塔径は、円筒支持体内部で作業するスペースから決定する。例えば、蒸留塔の外径５００mm、蒸留塔を保温する断熱材厚み１１５mmとすると、蒸留塔の塔径は５００mm＋１１５mm×２＝７３０mmであり、蒸留塔の下部にスチルを設置しているので、そのスペースを計算に入れると蒸留塔の占有エリアは約１０００mmの塔径に相当する。一方、蒸留塔の周囲で作業するには、幅６

００ｍｍ以上のスペースを取ることが必要で、円筒支持体の塔径は１０００ｍｍ＋６００ｍｍ×２＝２２００ｍｍ以上とすべきである。

【００１１】一方、円筒支持体は、塔径を大きくすると風荷重等も大きくなり、より強度が要求されることとなる。円筒支持体の強度は、肉厚で調整し、例えば、塔高３４ｍの蒸留塔を保持する円筒支持体の塔径２４００ｍｍにおいては、十分な強度を保つために、下部分の板厚を１２ｍｍ、上部分の板厚を６ｍｍとする必要がある。

【００１２】本発明の蒸留塔の保持は、円筒支持体の内部に設置し、円筒支持体で保持するため、予め複数ブロックに分割して工場製作し、現地で組立てるプレハブ工法を採用することができる。このプレハブ工法においては、工場において複数に分割した円筒支持体内に複数に分割した蒸留塔を配置すると共に、配管類も円筒支持体内に配設し、各ブロック間の円筒支持体、蒸留塔、配管類をフランジ接続となし、最下段ブロックの円筒支持体を基礎ボルトで固定したのち、順次各ブロックを下段ブロックの上に載置し、円筒支持体、蒸留塔、配管類のフランジをボルトで締めつけて組立てる。

【００１３】また、複数の蒸留塔を円筒支持体で保持する場合は、塔高の１番高い蒸留塔を円筒支持体内に配置して保持せしめ、他の蒸留塔、付属機器、例えば、リボイラー、コンデンサー、タンク、プラットホーム、階段等を円筒支持体の外周部に配置して保持せしめる。さらに、塔高の高い複数の蒸留塔を設置する場合は、全ての蒸留塔を円筒支持体内に配置して保持せしめることもできる。

【００１４】

【実施例】実施例１

以下に本発明の詳細を実施の一例を示す図１に基づいて説明する。図１は本発明の蒸留塔の保持方法を示すもので、３段に分割して工場製作し、現地で組立てる場合の概略説明図である。

【００１５】図１において、１は円筒支持体で、１ａ～１ｃの３段に分割され中心部には２ａ～２ｃの３段に分割された塔高の１番高い蒸留塔２が支持されている。また、各円筒支持体１ａ～１ｃの外周には、支持部材３を介して４ａ～４ｃの３段に分割された蒸留塔４と５ａ～５ｃの３段に分割された蒸留塔５が支持され、各ブロック体Ａ～Ｃを構成している。

【００１６】各ブロック体Ａ～Ｃは、工場で製造され、現地基礎上にブロック体Ａから順次組立てられる。各ブロック体Ａ～Ｃの接続は、ブロック体Ａの円筒支持体１ａ下部を現地基礎上に基礎ボルトで固定する。そして、各ブロック体Ａ～Ｃの各円筒支持体１ａ～１ｃ、各蒸留塔２ａ～２ｃ、４ａ～４ｃおよび５ａ～５ｃは、図示していないが接続部のフランジをボルトにより接続して組上げられ、蒸留塔２と円筒支持体１との間に所定の間隔、例えば、作業可能な６００ｍｍ以上のスペースが設けられている。

【００１７】また、最上部の円筒支持体１ｃの上部には、雨水の浸入を防止するための天蓋６が設けられている。このため、蒸留塔２は、周囲が円筒支持体１で包囲密閉されているので、円筒支持体１内の温度が安定しており、蒸留塔２の外表面からの放熱が抑制され、安定運転でき、省エネルギーを図ることができるよう構成されている。

【００１８】また、配管は、図示していないが円筒支持体１ａ～１ｃ内に配設され、各ブロック体Ａ～Ｃの各円筒支持体１ａ～１ｃ、各蒸留塔２ａ～２ｃ、４ａ～４ｃおよび５ａ～５ｃの接続と同様にフランジを介してボルト接続される。さらに、流量指示調整弁や圧力計は、円筒支持体１の外部に設置され、円筒支持体１内に入らなくても、流量調整や塔内圧力を確認できるようになっている。

【００１９】円筒支持体１ａ～１ｃ内部の蒸留塔２の下段リボイラー部、中段フィード部ならびに上段熱交換器部には、各ブロック体Ａ～Ｃの組立て、分解作業のための作業床が設けられている。円筒支持体１は、各円筒支持体１ａ～１ｃの上部に各ブロック体Ａ～Ｃの組立て、分解作業のための作業床が設けられている。

【００２０】上記のとおり構成したことによって、工場で製作された各ブロック体Ａ～Ｃを現地の基礎上に構築するには、先ずブロック体Ａを基礎上に載置し、基礎ボルトで締めつけて円筒支持体１ａを固定したのち、ブロック体Ｂをブロック体Ａの上に載置し、蒸留塔２ａと２ｂ、蒸留塔４ａと４ｂ、蒸留塔５ａと５ｂ、円筒支持体１ａと１ｂの各フランジをボルトで固定して接続すると共に、各配管のフランジをボルトで連結する。ついで、ブロック体Ｃをブロック体Ｂの上に載置し、蒸留塔２ｂと２ｃ、蒸留塔４ｂと４ｃ、蒸留塔５ｂと５ｃ、円筒支持体１ｂと１ｃの各フランジをボルトで固定して接続すると共に、各配管のフランジをボルトで連結し、構築作業を完了する。

【００２１】したがって、塔高の１番高い蒸留塔２は、周囲が円筒支持体１で包囲密閉されているので、円筒支持体１内の温度が安定しているため、外表面からの放熱が抑制されて温度が安定し、蒸留塔２を安定運転できると共に、省エネルギーを図ることができる。また、各ブロック体Ａ～Ｃは、工場で製作されるため、工期を従来工法の１／２に短縮できると共に、架構を設置する必要がなく、鋼材使用量と工事費を低減できる。さらに、配管は、殆どを円筒支持体１内に設置したため、配管の腐食を抑制することができる。

【００２２】実施例２

図２、図３に示すとおり、塔高：３４１９２ｍｍ、塔内径：５００ｍｍ、充填高さ：２８３８０ｍｍ、充填物：住友重機械工業株式会社製、商品名スルザーメラパック３５０Ｙを充填した蒸留塔の外周を、厚み１１５ｍｍの

断熱材（パーライト）で被覆した蒸留塔２１を、高さ：４０７００ｍｍ、内径２４００ｍｍ、肉厚：下部１２ｍｍ、上部６ｍｍの円筒支持体２２内に配置して保持せしめた。また、塔高：１５７２４ｍｍ、塔内径：４００ｍｍ、充填高さ：１０９６５ｍｍ、充填物：住友重機械工業株式会社製、商品名スルザーメラパック３５０Ｙを充填した蒸留塔の外周を、厚み１１５ｍｍの断熱材（パーライト）で保温した蒸留塔２３を、円筒支持体２２の外部に支持部材２４で支持させて設置した。さらに、塔高：６５０３ｍｍ、塔内径：５００ｍｍ、充填高さ：４０８５ｍｍ、充填物：住友重機械工業株式会社製、商品名スルザーメラパック３５０Ｙを充填した蒸留塔の外周を、厚み１１５ｍｍの断熱材（パーライト）で保温した蒸留塔２５を、円筒支持体２２の外部に支持部材２４で支持させて設置した。さらに、各蒸留塔２１、２３、２５の各頂部に熱交換器２６、２７、２８を連結すると共に、各下部にリボイラー２９、３０（図示せず）、３１をそれぞれ配置した。なお、３２は熱媒の加熱炉、３３は煙突、３４は円筒支持体２２の天蓋である。

【００２３】図２、図３の蒸留塔２３に脱塩基処理したインドール濃度４．５％のナフタリン蒸留の釜残油を供給し、ナフタリン等の軽質分を除去したのち、共沸剤としてジエチレングリコールを添加して蒸留塔２１の中段に装入し、共沸蒸留してモノメチルナフタリン留分とジエチレングリコールを留出させ、塔底よりインドール濃度１０％のボトム油を抜き出した。留出させたモノメチルナフタリン留分とジエチレングリコールは、静置してジエチレングリコールを分離し、蒸留塔２５で混入するジエチレングリコールを除去したのち、図示しない精密蒸留塔に供給し、α－モノメチルナフタリンとβ－モノメチルナフタリンを分離回収した。蒸留塔２１の塔底より抜き出したインドール濃度１０％のボトム油は、図示しない共沸蒸留塔、精密蒸留塔で蒸留して濃度９４％以上のインドールを回収した。

【００２４】上記蒸留において円筒支持体２２内に設置した蒸留塔２１と、円筒支持体２２の外部に設置した蒸留塔２５のそれぞれについて、３日間に亘って熱交換器性能確認試験を実施し、その平均値を求めた。その結果を表１に示す。

【００２５】

【表１】

		円筒支持体内 蒸留塔21	円筒支持体外 蒸留塔25
熱交換器	冷却水入口温度(℃)	23.7	53.8
	冷却水出口温度(℃)	30.7	64.2
	冷却水流量(m^3/Hr)	30.9	5.0
	測定交換熱量QC(Kcal/Hr)	218940	52300
	伝熱面積(m^2)	8.3	1.5
リボイラー	加熱油入口温度(℃)	299.8	299.8
	加熱油出口温度(℃)	270.5	266.3
	加熱油流量(m^3/Hr)	21.6	6.9
	測定交換熱量QR(Kcal/Hr)	326054	101922
	伝熱面積(m^2)	31.4	6.9
	QC/QR	0.671	0.513
	放熱量(Kcal/Hr)	107114	49622
	放熱ロス(%)	32.9	48.7

【００２６】表１に示すとおり、円筒支持体２２内に設置した蒸留塔２１の放熱ロスは、円筒支持体２２外に設置した蒸留塔２５の放熱ロス４８．７％に比較し、３２．９％と約２／３に低減できている。

【００２７】

【発明の効果】本発明の請求項１の蒸留塔の保持方法は、円筒支持体の内部に蒸留塔を設置し、円筒支持体で蒸留塔を保持したことによって、工場製作を主体とするプレハブ工法とすることができ、工期を大幅に短縮できると共に、蒸留塔の周囲が円筒支持体で覆われるため蒸留塔外表面からの放熱が抑制され、蒸留塔を安定運転でき、エネルギーロスを低減することができる。

【００２８】また、本発明の請求項２の蒸留塔の保持方法は、請求項１において円筒支持体の外周部で他の蒸留塔、付属機器を保持することによって、工場製作を主体とするプレハブ工法とすることができ、工期を大幅に短縮できると共に、架構を設ける必要がなく、その分鋼材を節減することができる。

【図面の簡単な説明】

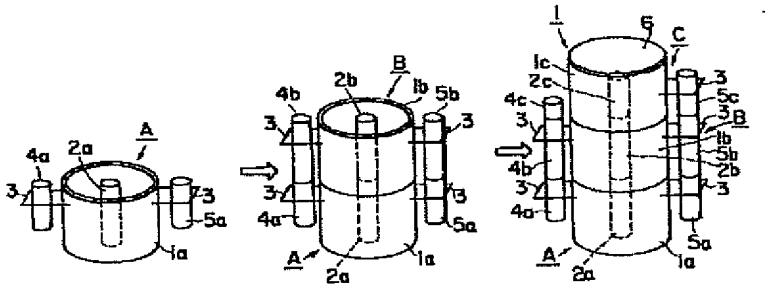
【図１】本発明の蒸留塔の保持方法を示すもので、３段に分割して工場製作し、現地で組立てる場合の概略説明図である。

【図２】実施例２で使用した蒸留設備の正面図である。

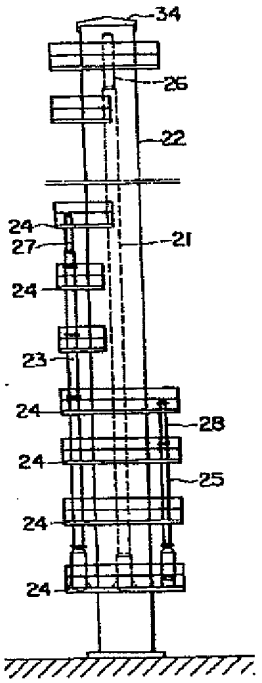
【図３】実施例２で使用した蒸留設備の側面図である。

【図４】インドールの製造設備の系統図である。
【図５】現地工事主体の従来工法の説明図で、（ａ）図は架構を構築した状態の斜視図、（ｂ）図は架構内に蒸留塔を設置した状態の斜視図である。
【符号の説明】
１、２２　円筒支持体
２、４、５、２１、２３、２５、４１、４５、５１、６４、６５、６６　蒸留塔
３、２４　支持部材
６、３４　天蓋
２６、２７、２８　熱交換器
２９、３０、３１　リボイラー
３２　加熱炉
３３　煙突
４２　軽質分
４３、４８　共沸蒸留塔
４４、５０　分離槽
４６、４９　精密蒸留塔
４７　タンク
６１　支柱
６２　床
６３　架構
Ａ～Ｃ　ブロック体

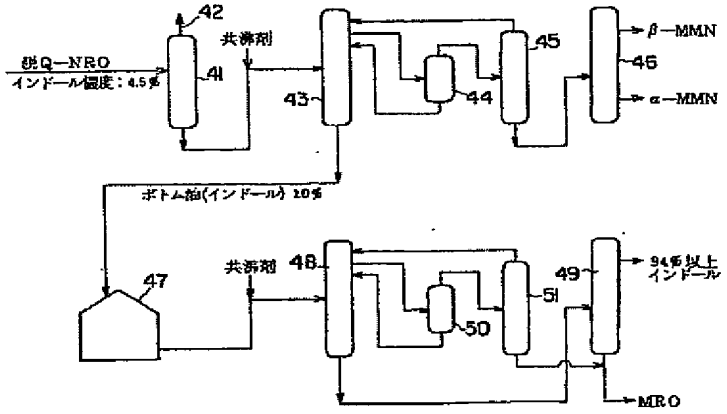
【図１】



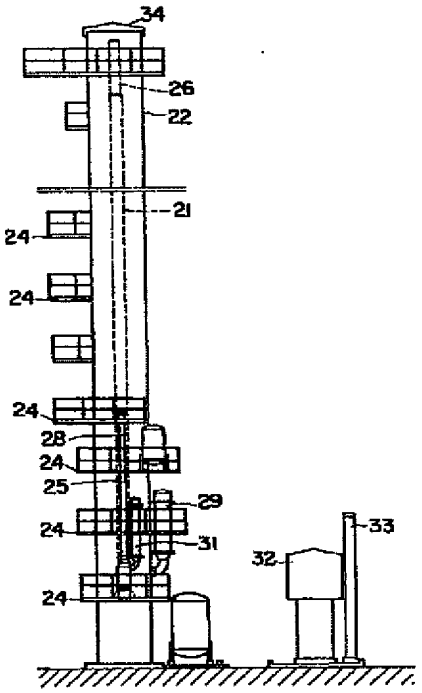
【図２】



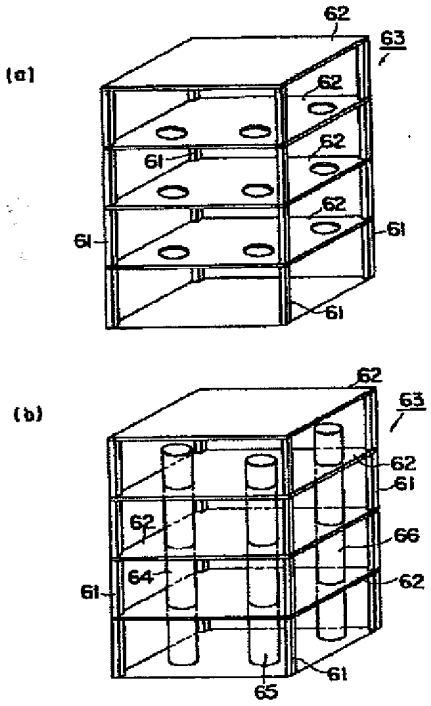
【図４】



【図３】



【図５】



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